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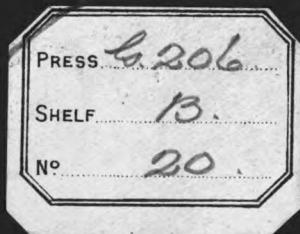
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On the issue of a spirit ration during the Ashanti Campaign of ...

Edmund Alexander
Parkes



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ON THE
ISSUE OF A SPIRIT RATION
DURING THE
ASHANTI CAMPAIGN OF 1874

ON THE
ISSUE OF A SPIRIT RATION
DURING THE
ASHANTI CAMPAIGN OF 1874

TO WHICH ARE ADDED

TWO APPENDICES
CONTAINING EXPERIMENTS

TO SHOW THE RELATIVE EFFECTS OF RUM, MEAT EXTRACT
AND COFFEE, DURING MARCHING, AND THE USE OF
OATMEAL DRINK DURING HEAVY LABOUR

BY

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INTRODUCTION

THE following pages contain a reprint of a Report on the issue of spirits during the Ashanti campaign, which was written for Sir William M. Muir, K.C.B., the Director-General of the Army Medical Department,* and was by him communicated to the 'Lancet.'

I have added to it two Appendices as contributions towards the answer of a question of high importance, not only to soldiers, but to all who are called on to make great bodily exertion without the power of obtaining the usual food and rest.

When, as so frequently happens in campaigns, soldiers are marching nearly the whole of the day, and can obtain their regular food only late in the evening, what can be given to lessen the sense of great fatigue, and to enable them, not only to continue the march, but to be ready for any emergency which may arise? It must be something easily carried, and easily prepared and served out, as any long halt may be impossible. The usual resort is to a spirit ration, and there is no doubt that for a time this exerts a reviving effect. But is it the best thing

* Published in the 'Lancet,' August, 1874.

which can be given, and are its advantages without alloy? I think it can be shown that it is not a perfectly reliable aid, and requires, when used at all, to be so with a full knowledge of its mode of action.

The first effect of alcohol, when given in a moderate dose (for example, what is equal to one fluid ounce of absolute alcohol) is reviving, but this effect is transient. As shown both in the Report and in the first Appendix, the reviving effect goes off after, at the utmost, two and a half miles of additional march, and sometimes much before this; then the previous languor and sense of exhaustion not only return, but are sometimes more intense, and if alcohol is again resorted to its effects now are less satisfactory. Its reviving power is usually not so marked, and its peculiar anaesthetic and narcotizing influence can often be distinctly traced. The men feel heavy, dull, disinclined to march, and are less willing and cheerful. It is clear, then, that alcohol is not a very trustworthy aid; for supposing a commanding officer, having marched twelve or fourteen miles, and desiring to cover ten more miles, finds his men weary, and, not being able to halt and feed them, orders an issue of spirits of an amount sufficient to revive but not to depress. The first effect will be good, but in less than an hour his men will be as weary as before, or probably more so. If he then reissues the spirit within so short a period of time it is certain that in the case of many men, perhaps the majority, the marching power will be

lessened. Even the reviving power of the first issue is not always so considerable as might be supposed, and, indeed, I have been surprised to find how little good effect it has sometimes produced.

It appears to me, therefore, that spirits, as an issue, should be kept for emergencies, as when after great fatigue a sudden but short exertion is required, or, when a march being ended, there is great depression and failure of the heart's action, such as occurs when men have been thoroughly wetted during an exhausting march. Alcohol given in quantities short of producing commencing narcotism (*i. e.* in quantities under 1 to $1\frac{1}{2}$ fluid ounce of pure alcohol = $2\frac{1}{2}$ to $3\frac{1}{2}$ ounces of rum), and especially with hot water, appears from the statements given in the Report to be very reviving, and if food be taken at the same time, or soon afterwards, it seems probable that its useful effect would be alone produced.

To give strength to the men during the march, when the usual food cannot be taken, the meat extracts and coffee are both better than spirits, as will be seen from the experiments in the first Appendix. Much discussion has taken place as to the true position of meat extract among the foods, but this does not concern the point in question. That the meat extracts, when given in sufficient quantity (not less than half an ounce in water for a single issue), are powerfully reviving and sustaining is a matter of simple experiment and evidence, and whether it is the potash salts or the organic extract they contain

which exerts the sustaining effect is not of moment as far as this practical point is concerned. The first Appendix shows how unanimous the soldiers who were experimented upon were in assigning a great superiority in reviving and sustaining power to the meat extract over the spirit. The meat extract can also be repeated over and over again without injury, indeed with benefit, while its portability and the ease of preparation (for cold water dissolves it almost as readily as warm) make it a most convenient issue for marches.

Coffee, again, is also very reviving during fatigue, and has the great advantage of quenching thirst much better than the meat extract, but it requires to be well made and to be palatable, which is not always easy to ensure in forced marches. The well-made decoction of at least one ounce of coffee is necessary to produce a marked effect, and an equal quantity of sugar is also desirable. As in the case of the meat extract, this may have to be repeated two or three times in a long march.

When troops are called upon to undertake very heavy work in camp or entrenchments there is another plan, which at one time was frequently used by English workmen both in iron and glass works, and which is strongly to be recommended. It is the use of a drink of thin boiled oatmeal, which sustains in an extraordinary degree and also quenches thirst.

An illustration of this fact I have been enabled
to furnish by the kindness of Mr Owen, the Engineer in Chief

of the Great Western Railway, and of Mr Voss and Mr Armstrong, two of the Divisional Engineers, to give an account in a second Appendix of some extremely heavy work lately performed on the Great Western Railway during the change from the broad to the narrow gauge. It was necessary to take up and relay the rails in the shortest possible time, and the same men were obliged to be kept at the work for many hours. The summer days were chosen, so that almost literally the men worked night and day, stopping only for meals and a little sleep. They took their ordinary meals and beer with the meals if they pleased, but during the long periods of the work they were supplied with nothing but a drink of oatmeal boiled in water, and beer and spirits were prohibited. Each man had an allowance per diem of 1 lb. of oatmeal and $\frac{1}{2}$ lb. of sugar, and so important was this deemed that a man was told off specially for every twenty men, and was solely employed in boiling* and taking the oatmeal drink to the men. This liquid was drunk in large quantities and was most highly approved of. The character of the work and the temper of the men were much better, in the opinion of the engineers, than would have been the case if beer or spirits had been issued.

For marching troops the supply of boiled oatmeal would probably be difficult unless there were port-

* It was found necessary to boil the oatmeal very thoroughly and carefully. Horses, during heavy work, are often given meal of some kind in water to drink, and with very good effect.

able kitchens, cooking on the march, or unless thick porridge could be carried for subsequent mixing with water. But for such works as throwing up earthworks and digging entrenchments this plan would be most useful. The addition of the sugar is important, as it not only renders the oatmeal more palatable, but supplies a food which is probably useful for labour.

By means, then, of the skilled use under different circumstances of these four substances—meat extracts, oatmeal and sugar, coffee, and alcohol—soldiers can be sustained and revived under great exertion, and will become competent for the performance of the labours which their officers may demand from them and which may be essential to carry out the plan of the general in command.

In what has been said it is, of course, to be understood that the use of these substances is not intended to take the place of the usual food, but to be additional to it. Nothing can ever supply the good rations the campaigning soldier ought to have, and when it is clearly seen that the food is to the animal machine what coal is to the steam engine, and that force and work are simply products of food and are measured by it, its supply in campaigns will receive more study and care than has usually been the case. The substances I have named, or others which may be proposed to answer the purpose of temporary support, are most important in their special way, but should aid, and not supersede, the y food.

ON THE

ISSUE OF A SPIRIT RATION DURING THE ASHANTI CAMPAIGN OF 1874.

IN accordance with the desire of the Director-General of the Army Medical Department, I brought together some evidence I collected on the issue of a spirit ration in the late Ashanti campaign. I need not refer to the gravity of the question whether, under the particular circumstances of the Gold Coast campaign, the issue of rum was desirable or the reverse. If the question could be completely answered, which is unfortunately not the case, it would be of great military importance.

Sir Garnet Wolseley adopted in this brilliant campaign the following plan:—Rum was carried with the troops, but was only issued on the recommendation of the medical regimental officers during the march from the coast to the Prah, and on the recommendation of the principal medical officer with the forces after the Prah was crossed. When issued, the quantity was half a gill (equal to $2\frac{1}{2}$ fluid ounces), and it was given in the evening after the fatigues of the day.

In seeking for evidence on the effect of this issue, I thought that the most reliable opinions would be given by those medical officers who had actually marched with their men to Coomassie, and on whom the responsibility of the issue was at first thrown ; and I therefore applied to Dr Troup, surgeon to the 42nd Regiment ; to Mr Wiles, surgeon-major of the 2nd Batt. Rifle Brigade ; and to Dr Allen N. Fox, who marched with the part of the 23rd Regiment which landed, for information on this point.* And I have to thank these gentlemen very cordially for the information they have kindly put at my disposal.

The points on which I particularly requested information were as follows :—1. If any teetotallers were with the regiment, how did they compare with their comrades in marching power and in resistance to malaria ? 2. In the case of the men who were not teetotallers, how did the issue or the non-issue of rum affect them ? And what was the general conclusion as to the desirability, or not, of a rum ration to which the history of the march led ?

I asked, as a matter of course, for the opinion of Sir Anthony Home, who, though prevented by illness from marching to Coomassie, made all the medical arrangements, and who studied with the greatest care all the points connected with the preservation of the health of the men. My friend Dr Kynsey, who was with the 1st Field Hospital, has also given me some important evidence, and has for-

* Dr Fegan, who marched with the Naval Brigade, being on service on the coast, I have been unable to obtain his evidence.

warded also the valuable opinion of Surgeon-Major Jackson.

I also thought it desirable to take down the evidence of some intelligent non-commissioned officers who made the march, and I shall give their evidence in their own words. I took the non-commissioned officers whom I found at Netley, and who were mentioned to me as intelligent and trustworthy.

The evidence is arranged in the following order :—

From Dr Troup, 42nd Highlanders.

- „ Mr Wiles, 2nd Batt. Rifle Brigade.
- „ Dr A. N. Fox, 23rd Welsh Fusiliers.
- „ Sir Anthony Home, Deputy Surgeon-General.
- „ Dr Kynsey, 1st Field Hospital.
- „ Sergeant-Major Barclay, 42nd Rifles.
- „ Sergeant Kemp, 2nd Batt. Rifle Brigade.
- „ Sergeant Baker, „ „ „
- „ Sergeant Perren, Army Hospital Corps.
- „ Corporal Rose, „ „ „
- „ Corporal Haidley, „ „ „

After adducing this evidence, I shall venture to state the impression it has made upon me.

EVIDENCE FROM THE 42ND REGIMENT

Letter from Dr TROUP

Having instituted inquiries regarding the number and health of the teetotallers of the 42nd Regiment while engaged in the late campaign of 1874 to Africa, I have compiled the enclosed table. I have

Nominal Return of Non-Commissioned Officers and Men of the 42nd Royal Highland Regiment ("The Black Watch") who were Total Abstainers while engaged on the Gold Coast.

[The names and rank are omitted.]

No.	Age.	Years ser- vice.	Service, &c. Former service abroad.	Number of admissions during expedi- tion in Africa from Jan. 3rd to arrival in England.	Medical history and remarks.
1	34	16	9 years in India	None	No hospital admission since 1862. Acted as quartermaster-sergeant during war. Never sick.
2	37	19	11 , , ,	Once	Suffered from dysentery of acute form, fever of remittent type, and general debility, with hepatic derangement. Very much exposed to climate as hospital sergeant.
3	38	17	9 , , ,	None	While in India suffered from fevers of continued remittent and intermittent types. No hospital entry since 1864. Used to drink hard.
4	34	16	9½ , , ,	None	This soldier while in India never suffered from fever. One admission for ebriotsis in 1867; since then never in hospital.
5	32	14	7 , , ,	None	Suffered from primary and secondary syphilis and fever of intermittent type in India. No admission since 1868.
6	23	5	None	None	This soldier has never been in hospital either at home or on Gold Coast.
7	34	15½	8 years in India	None	Frequently in hospital while in India with fever of intermittent type, also venereal. During the past four years has never been in hospital.
8	37	17	10 , , ,	None	Medical history sheet shows only minor ailments. A strong, healthy, and powerful man. Earned the V.C. on Gold Coast expedition.

9	27	3	None	None	Medical history sheet blank. A tall and powerful well-built soldier.
10	33	10	3 years in India	None	Four admissions from ardent continued fever in India; otherwise nothing.
11	23	5 $\frac{1}{4}$	None	None	Several attacks of gonorrhœa in 1871; several attacks of primary syphilis in 1872. No other entry worthy of record.
12	41	17	10 $\frac{1}{2}$ years in India	None	Suffered from primary syphilis, date of which not known; secondary syphilis followed in 1863, and some affection of eye noted as "cracitis." Since then no admission.
13	36	16	9	"	Suffered several times from fever, remittent, intermittent, and continued, in India. No admission since 1865 till 1870, when he had a bad attack of erysipelas.
14	34	14	6	"	A large medical history sheet. Suffered from dysentery, acute and chronic, and intermittent fever and continued. No admission after 1870.
15	40	15	8	"	An old soldier, and only fit for hospital duties. He was employed as hospital orderly during expedition. Suffered from fever and acute "liver" in India; but very healthy in Africa, and never fell out, though he was hard worked.
16	37	15	5 $\frac{1}{2}$	"	Previous admissions from minor complaints. Very healthy. Never in hospital during his soldier's career.
17	23	3	None	Once	During latter part of 1872 suffered from a severe attack of enteric fever, and suffered from diarrhoea on his way home.
18	20 $\frac{1}{2}$	3	None	Once	A young soldier, who was left behind on the march to Coomassie, and was sent on board ship suffering from inflammation of lung.
19	19 $\frac{1}{2}$	1 $\frac{1}{2}$	None	Once	Only two admissions, and then from minor ailments.
20	27	10	None	None	No medical history. Only one entry in medical history sheet.
21	22 $\frac{1}{2}$	9 $\frac{1}{2}$	None	Once	No medical records of admission into hospital.
22	22	2	None	None	Never in hospital.
23	20 $\frac{1}{2}$	2	None	None	Marched all the way. No medical entry worth recording.
24	23	3 $\frac{1}{2}$	None	None	Acted as an hospital orderly.

brought together all the information I can, taking their previous medical history from the Medical History Sheets. This table shows a very favorable state of health, even under very adverse circumstances, there having been but little sickness amongst them. A large proportion of them have served in India, and suffered there from tropical ailments. I cannot overlook the fact that, taking the life of the soldier under every circumstance, the total abstainer or temperate man has the advantage, preserving his health better, and performing his duty better, and in his older years withstanding climatic influences which, as a younger man, upset him. Some of the soldiers recorded in the return have displayed wonderful health on the West Coast of Africa even under extreme fatigue and exposure. I hope this table may corroborate in some degree the good that may be effected by temperance. Most of the men recorded are personally known to me. A large proportion are men of exceptionally good physique, and I feel quite sure that, with their good intentions and actions, personal good has followed, and a proportionate advantage to the State.

My opinion all along has been the same, and our little war of 1874 has corroborated it, that while men are careful to be temperate they are more careful in other respects, and not so open to those abuses on the line of march which in many cases open the door for disease, and, in the end, give rise to so much mortality and invaliding in the service. This table shows a large proportion of non-commissioned officers and old soldiers, whose experience

is worthy of being recognised—and who have taken to teetotalism, some from the want of control, others from the opinion that indulgence in alcohol is hurtful, while others have taken to it from their great susceptibility to its influence, when taken even in moderation. The influence and example of such men must be all-powerful in regulating the conduct of the young men who are drafted into the service, a large number of whom, in the 42nd, come from country avocations in Scotland, born of respectable people, and many of whom on first joining have never indulged to any extent in drinking, and some of whom have never even smoked. This class of recruit, who has never tasted of the dissipation of a town life, can at once be recognised on the primary inspection, presenting alike a good physique and purity of respiratory and circulatory systems, and far superior in every particular to the generally dissipated townsman, with his bloodshot eye and his throbbing and over-excited heart. To such, then, coming from his country home to a life so new to him, a continuance of temperate habits, aided by the example of his superiors, would be fraught with the greatest possible advantage both to himself and the State. During my service I have often had to lament the results of incipient drinking in the young soldier, crime generally commencing with it, and in company, or soon after, disease, the two, as it were, joining hands together; whereas the young and temperate recruit is but seldom seen by the medical officer either in confinement or in hospital. It is a recognised fact that the Medical History Sheet will

tell what the Defaulter Sheet is, and if we trace the cause we generally find it to be intemperance. While, however, supporting total abstinence, or at least abstinence from alcoholic stimulants, as rum, &c., as part of the soldier's allowance in ordinary times and under favorable circumstances, I am at the same time of opinion that rum has been useful to a certain extent in our little warfare, where the daily routine of his life has been so altered and under exposure to a bad climate, with its depressing effects where daily fatigue had to be endured under unfavorable influences so foreign to his existence; where moisture and heat, with great exposure to sun by day and cold and chilly nights, with but partial covering for him, united in producing those depressing and enervating results which were readily seen in all. I think the experience of a large number of medical officers engaged during the expedition would bear me out, provided precautions were taken to give the rum at a proper time, when the system had supported its calls, and after the fatigues of the day; for while care and abstinence was necessary during the heat of the day, I am convinced that a little spirit, well diluted, proved beneficial, and while aware that the advantage, if it may be so called, is only temporary, yet its use had a tendency to allay that depressing irritability which I found was so liable to upset the best when exposed to climatic influences so foreign to his nature.

I hope I have not overstretched the point, but my experience led me to justify the issue of rum.

When first we landed in Africa it was ordered that rum was only to be issued under exceptional circumstances of exposure and fatigue, an order which held good as far as the river Prah, up to which point on our journey rum was only occasionally recommended. After this, however, when we crossed into the enemy's territory, and we left many comforts behind, and of necessity more exposed, rum was, as a rule, daily issued, given after the evening meal, and in a diluted state, and with the precaution that each man should receive his allowance at the tub, to prevent those refusing it giving it to their comrades. On one occasion only I recommended an issue of hot rum in the case of a party left behind marching late in the day, and missing their way, and not reaching camp till nearly 10 p.m. In this instance I think an allowance of rum and hot water, with cocoa afterwards, proved beneficial, enabling the party to march with us next morning at an early hour, and with a very fatiguing march before us. One thing especially struck me. I happened to be near the place of issue of rum the first occasion it was given. I observed many of the young soldiers taking only about half their allowance, others refusing, while all the older soldiers from fifteen to sixteen years' service looked as if they would be none the worse of another, after being particularly careful to have their allowance in full. A remark made by a staff officer engaged in the Red River expedition was very suggestive (on this occasion rum was not issued). He said, "We lived on the climate then, but here the climate lives

on us." No truer remark could have been made, for, on all alike, officer and soldier, the climate was telling. The system looked as if it were undergoing a gradual decay ; the excessive amount of cutaneous perspiration and the great loss of muscular vigour caused a blanched and anaemic appearance. In many cases an unusual depression of spirits followed as well as irritability of temper. This I noted more especially after the excitement was over, and when we had to march over old ground with but little change of scenery, passing through forest and jungle of a very monotonous character, and in our journey through which we were unable to get a glimpse of the horizon, I may say from Cape Coast Castle to Coomassie. Regarding my experience of the use of stimulants among the officers : one officer was teetotal—a young officer, who suffered once or twice from fever of a mild character, but who went all the way and marched regularly with his company ; a few other officers were very abstemious, drinking only the lighter clarets—one of them a very young officer. These also stood the climate well ; but that blanched and anaemic appearance presented itself, and, although performing their duty, evidently making an effort to do so—their young and undeveloped systems struggling with the climate. The majority of the officers preferred the use of stimulants in moderation, and then after the fatigues of the day, and taken with and after the evening meal. I may mention the case of my little mess, consisting of the officer in command, the quartermaster, and myself. We thus used

stimulants with and after our dinner meal. We all three marched to Coomassie and back; never felt sick or sorry, although as staff we had many calls on us day and night, and I am of the three the only one who has suffered, having been attacked with remittent fever on my landing in England, but this happily passed off in four days under the daily use of quinine in small doses.

(Signed) B. W. TROUP, M.B.,
Surgeon, 42nd Royal Highland Regiment
("The Black Watch").

Portsmouth, May 8th, 1874.

EVIDENCE FROM THE 2ND BATT. RIFLE BRIGADE

Letter from Surgeon-Major WILES

Regarding Paragraph 1 :—The 2nd Rifle Brigade seem never to have had many teetotallers in their ranks. Prior to leaving Ireland for the West Coast there were 34; these diminished on going on board to one sergeant and four men, who continued in their principles during the campaign. Only one of these five suffered from sickness whilst in the country; another had an attack of fever on board ship. They all did their marching well, and looked as well as, if not better than, the other men.

Regarding No. 2 :—On commencing the march up country the order was that no spirit ration should be given unless on express recommendation of the regimental surgeon. Whilst on the march I did not see any indication for giving it, and only gave it

about three times up to the arrival at Prahsu. At Barraco, where we were halted for some time (ten days), the men suffered from diarrhoea and febricula. I thought the issue of a ration here perhaps might do good, so gave it once or twice; but finding that the result was unsatisfactory, there being more cases the next day, I stopped its issue. (This sickness I considered to be owing to the disturbance of surface soil.) On arriving at Prahsu its issue was taken out of the hands of the regimental surgeon by recommendation, I believe, of the principal medical officer, and it was afterwards given nearly every day, or at all events whenever it could be obtained, which was nearly every day. It was generally given, by my recommendation, in the evening; but one morning, as it had not arrived the previous evening, it was given at 5 a.m. I considered at the time, and on thinking it over am now more strongly of opinion, that its issue during the expedition, instead of being beneficial, only made the men more susceptible to the malarious poison and to affections of the bowels. Of course this is only an individual opinion, but it is an unprejudiced one, although I am far from being a follower of teetotal principles. My opinion regarding its use in West Africa was so strong that, personally, I did not take any stimulant of any kind during the whole period I was in West Africa, and during that time I never felt better, and had no sickness of any kind, and marched the whole way up and down, besides doing some amount of hard work. My experience (derived from active service in the Crimea, India, and China)

is very much against its use on active service, as I think its use renders men especially liable to dysentery and camp diarrhœa, and I think it was shown to have that tendency especially in such a climate as the West Coast of Africa. Regarding the men's feelings, I did not find that they missed its not being issued except when they came amongst other corps who were getting it. They cared more for the tea and lime-juice, with which they filled their bottles for the day's march.

Although so strongly against the issue of spirits, I am very strongly in favour of supplying the men with their pint of malt liquor daily when practicable, as I have seen that of great good and especially so on board transports.

(Signed) J. WILES, Surgeon-Major.

Winchester, May 29th, 1874.

EVIDENCE FROM THE 23RD WELSH FUSILIERS

Letter from Dr ALLEN NESBIT Fox

I regret I can furnish very poor information on the subject of your communication. I only joined the 23rd after their arrival at the Prah. They were then about 120 strong, and, as well as I remember, none were teetotallers; all took their ration of rum in the evening. This was first issued to them at a station called Yancoomassie-Fantee, about twenty-five miles distant from the Coast. They were in the habit of receiving it daily after sunset up to the time I joined them. From the Prah to Coo-

massie it was not regularly given, not being obtainable at some of the stations from the difficulty of transport. Hot tea or cocoa was the substitute. The men were always better pleased and more contented with the spirit than with any other beverage; but I cannot say I remarked any impairment of health or difference in their marching from its non-issue. Very few fell out on the march up country; those who did, from over-fatigue and debility, were immediately put in a hammock and had a small quantity of brandy-and-water. And this was given at the different halting places with marked benefit; it appeared to revive and set them up again. I consider the issue of a spirit ration in the evening, after the heat of the day was over, was rather beneficial to the men than otherwise. Should the issue of spirits be deemed advisable, I think a gill per man amply sufficient, and the evening the best time for giving it.

*Letter from SIR ANTHONY HOME, K.C.B., late Principal Medical Officer on the Gold Coast**

I wish it were in my power to give you any reliable data on the subject you write about. I have no deductions from carefully made observations to offer, and I hesitate at taking up your time with

* Dr Mackinnon, C.B., who succeeded Sir Anthony Home as principal medical officer, informs me that, "under the circumstances of climate, food, and water during the campaign, he considers that the spirit ration was an important addition to the other rations."

my individual opinions. I do not think that in the short period of the Gold Coast expedition observations could be made for a sufficient length of time on the same men, in sufficient numbers and under the same conditions of exposure, to decide the most important matter referred to. I doubt, even, whether exactness is attainable. In saying this, do not think I am deprecating inquiry. Whatever answers the painstaking and intelligent medical officers named give you, they will, I am sure, be most trustworthy. But the question is, Can bricks be made without straw? Can a conclusive judgment be formed without exact observations made *ad hoc*?

In the ration I recommended for the Gold Coast I included 1-64th of a gallon of rum ($2\frac{1}{2}$ fluid ounces) daily when the men were in the field—*i. e.*, actually campaigning.

The experience of the Red River expedition, that men could do very hard work without drink, was quite conclusive so far as that and strictly similar expeditions are concerned; and I had myself, in Canada, ample experience to the same effect. (The “lumberers” go into the woods and live there all winter; they sleep in holes dug in the snow, lying on spruce branches covered with buffalo robes; they work very hard; and it is an inexorable rule that all drinks found in the camp are destroyed.) But then the conditions in the Red River expedition were so different, so opposite to those on the Gold Coast. In the first instance there was an excellent climate; good rations of succulent food, easily

digested by healthy men doing hard work and sleeping soundly; no sickness present. On the Gold Coast there was tough, underfed beef; insipid, badly cooked food, difficult to digest, and after a time loathed by men who were mostly more or less ailing.

I had noticed in the Crimea, in India, and in New Zealand, that the men on campaigns had an absolute craving for varied diet; that even regular topers used to spend money in buying jams, sardines, pickles, cheese, &c., at the canteens. In fact, the men spent their money generally on food of this kind when it could be bought; they also used to give willingly 3s. 6d. a bottle for beer. Now, I believe if a very varied diet were always issued, the men could get on without alcoholic stimulants in all climates whatever, tropical as well as temperate; but it is visionary to hope that this can always be the case in war. Sutlers do a little in this way; Government can do nothing directly. Men cannot keep in health on poor, insipid, badly cooked rations. Under these circumstances I believe that, *after their day's work*, rum is desirable (beer and wine are impossible of attainment). There is a moment in which we may so keep up the system of a man tired to death by over-exertion as to bridge over the period in which lassitude ends in the beginning of disease. Good food will probably do this best, but it is rarely at hand when wanted; and even if it were, the digestive functions participate in the general lassitude, so that neither digestion nor assimilation go on sufficiently. At this time a

glass of beer or rum sends the machine on again, On the ground of expediency something must be said. The soldiers of our generation are accustomed to stimulants; stop these suddenly and completely on a short arduous campaign in which the forebodings of sickness have been incessant, and, if they don't fall into disease, you at least fret them, when, under the circumstances, the utmost cheerfulness possible is wanted.

The marines who garrisoned Abracrampa for a time had no rum (to which they were accustomed in their ration); but there were other circumstances, too long to narrate, more potential, to account for their anaemic appearance and ill health, than its want.

I send you an extract from one of my reports bearing on the subject:—"Rum should only be issued on the principle of a restorative after exhausting labour, such as an ordinary march in this country is. Given at the end of a day's march it will benefit —will help to ward off disease (*i. e.* will sustain against the depression in which disease has its beginning); if given in the morning before a march, in the delusive idea of adding to the men's strength, it will be simply pernicious. Beer or light wine would serve the purpose sought better, but they are not to be had. I will only add to this, that the quantity should be 1-64th of a gallon per man daily, given in an equal quantity of water."

PERSONAL EXPERIENCE

*By Surgeon W. R. KYNSEY, 1st Field Hospital,
Ashanti Force*

I started for duty on the West Coast of Africa with the idea that total abstinence from all kinds of alcoholic beverages was essential to maintain health. I met a few total abstainers during the campaign. I never attended them professionally, but they gave me the impression of being washed out in appearance and rather languid in manner. I performed the first two marches out of Cape Coast Castle without touching spirit of any kind, either during or after the march ; the distances were short, but I felt considerable fatigue after each. On the third march, after getting into camp, I took my first spirit ration, and I felt the better for it ; I did not feel so much depression, and the sense of fatigue became decidedly less after the brandy (about $2\frac{1}{2}$ oz.). This third march was longer than either of the first two by some four or five miles. First march, to Inquapine, five miles ; second march, to Acroful, seven miles ; third march, to Yancoo-massie, twelve miles. I, of course, must add, that I was becoming more accustomed to the road, and that, as the saying is, I began to feel my legs more, and this may have had something to do with the feeling of less fatigue ; still at the time I put a good deal down to the spirit.

After this I continued to take a small quantity of

spirit every day that I could get it, whether in camp or on the march. In camp I only took it at dinner and in small quantity, or on going to bed at night. For one accustomed to take some kind of alcoholic fluid at meals it is a serious privation to abstain from it; still I feel certain that I would have been better without it *in camp*. I have formed an equally strong opinion, in an opposite direction, as to its necessity on the line of march in a climate like the Gold Coast. I would give a small ration of spirit after each march, either with the dinner or immediately after it. I consider that the spirit ration aided digestion. The food, though good, required some help, and the spirit, I thought, gave it. On occasions when I was unable to get any, the food seemed to me to be longer digesting and to lie like a heavy weight in the stomach. With the men, in addition, the issue of a small spirit ration after a march makes them more contented and cheerful; this I found on many occasions.

I made all the marches to the Prah in the afternoon, and at first took cold tea on the march and hot tea at its conclusion. I could not sleep. I found the cold tea most refreshing. In marching in the early morning this objection to tea would not hold good.

Some of the marches between the Prah and Coomassie were very long, and as we got far up the country and near the enemy, although the actual length of the march was short, still it extended over a great many hours. On a few of these occasions I was induced to try, from excessive fatigue, the

effect of a little spirit, with the following result. At first the fatigue seemed to me to be less ; I felt decidedly better. But as I marched on, and the effects of the spirit disappeared, I felt decidedly less able to march, and the sense of fatigue became much more intensified, so much so that I never took the smallest portion of spirit during a march but I regretted doing so, and on all subsequent occasions, when I felt fatigued, I took some beef-tea, never spirit.

I used three kinds of spirits : at first brandy, then whisky, finally rum. I think the last the best.

Surgeon-Major Jackson, C.B., who was my chief in charge of the 1st Field Hospital, writes to me on this question of alcohol as follows :

"I look upon alcohol in some shape as a very useful adjunct to the ration, which, from our experience (and we were only occasionally restricted to the bare ration), became tiresome from its sameness. In a climate like the West Coast I think men *in camp* ought not to have spirits daily. There is a great tendency to hepatic congestion from want of exercise, and I believe the spirit would aggravate it. It should only be issued after the men have been employed on fatigue, or some duty, and then only once or twice a week. On the *line of march*, I believe a ration of spirit at bedtime, after a day's march, assists digestion and invites a good night's sleep. I would never recommend grog to be given until the march and the day's work be over ; the isolated cases where stimulants are required can be

supplied from the medical comforts. I believe rum to be about the best spirit for issue to the troops."

EVIDENCE OF NON-COMMISSIONED OFFICERS

Sergeant-Major BARCLAY, *42nd Regiment.* (*Wounded at Amoafu*)

Took very little rum himself; refused it on all occasions but two, as he found it did not suit him. He thought the country too hot for rum; it sharpened the appetite, but he found digestion did not go on so well with it. The men liked the rum, but he does not know there was any good reason for this. He had often known men have the same wish when rum was not required. His own view is that it was not needed and was not relished as it was in the Crimea. He felt slightly exhausted sometimes, but it never occurred to him that a stimulant would do good; on the contrary, he thought it would be likely to do harm. Certainly never knew harm done by rum not being issued. Sir Archibald Alison brought out some bottles of a white powder, which effervesced when put into water. He got hold of a bottle or two and gave it to the men, who liked it very much, and found it very refreshing.

Sergeant JAMES KEMP, 2nd Battalion, *Rifle Brigade*

In India eight years. While there never took spirits. Takes usually two pints of beer every day. Marched to Coomassie. There were eighty men in his company on starting. About fifty crossed the Prah and forty reached Coomassie; the rest were sent back with fever and dysentery.

Rum was issued on the second day after landing. Then there was none for two days; then one issue; then none. Altogether, had it four or five times between the Coast and the Prah. Halted at the Prah five or six days. Rum was issued every day. Beyond the Prah it was issued about every other day. One pint was divided between eight men ($2\frac{1}{2}$ fluid ounces per head). It was always given between six and seven in the evening, and was mixed with water or lime-juice and water to which sugar was added.

The marching was usually over by 11.30 a.m. He thought it heavy work, and when the marching was fifteen or sixteen miles the men found it very exhausting. In India he had marched seventeen or eighteen miles, and never found it so exhausting. He thought the rum ration was decidedly useful; when he took it he felt revived—decidedly more so than after tea alone. Most certainly, when he had had rum the evening before, he marched better than when he had had no rum. This was the opinion of all the men in his company. When he

did not have the rum he felt more "weakly" the next day. The amount of rum did not make him feel hot or uncomfortable, as it was taken with water or lime-juice; it did not make him feel sleepy. The opinion of all his company was in favour of the rum; they all seemed revived by it, and were more contented.

As to quantity, he thought it enough. The men were well satisfied with it, and no one wanted any more. If more had been issued, he thought the men would have been too much affected.

As to the time, he thought the evening quite the best. If given in the morning, it would, in his opinion, have made the men heavy for marching. In India he had seen men who had taken a little spirit in the morning very difficult to get along.

Sergeant BAKER, 2nd Battalion, Rifle Brigade

Made the march to Comassie; was wounded at the commencement of the last day's fight; had a slight touch of fever at the Prah. Half a gill of rum ($2\frac{1}{2}$ fluid ounces) was issued irregularly as far as the Prah; after that it was usually issued, but not every day; it was given in the evening, and sometimes mixed with lemon-juice. The longest march was eighteen miles; never felt tired on the march. When he took the rum after the day's march he felt it did him good; he felt as if he could have gone on again; it did not make him heavy or sleepy. He felt the want of it when he did not have

it. The men generally liked to have it. It was never issued during the march, and he does not know how it would have affected him if it had been. There were very few teetotallers in the regiment ; there were a few before they went out, but they gave up the pledge.

Sergeant PERRIN, *Army Hospital Corps*

A temperate man ; never takes spirits. Usually takes one pint of beer every day ; it is very seldom that he takes more. He had no sickness on the Coast ; the day after embarkation he had fever, and was ill for three days ; has been quite well since. Made the march to Coomassie with the 1st Field Hospital. He always took the rum ration, which, except on one occasion, was issued in the evening. He certainly felt revived by it, especially after a long march. Can give what he thinks a good example of this. It was on the first day's march homewards after Coomassie was burnt. They started about half-past 5 a.m., and were greatly delayed by swamps ; sometimes the men were marching through water up to the waist ; during the day perhaps they had altogether three miles of this marching through water. They did not get to their halting-ground until the evening. There was no rum ; only tea and biscuit. About 2 in the morning the rum arrived, and was served out immediately. He felt a great deal better for it ; it took off the languor and made him feel warm. The march re-

commenced between 5 and 6 o'clock, and was well done; but then it was shorter and there were no swamps, so the men were not much tired. All the men, as far as he knows, thought the rum did good; the quantity was enough. If the rum had been given on the march itself it would have done no good, only harm. His reason for saying so is that on two or three occasions on the march one of the doctors gave him a glass of grog; the effect was reviving for a quarter of an hour, and after that he felt a great deal more languid than he did before. He was so convinced of this that he would have refused it had it been offered again.

Corporal Rose, Army Hospital Corps

Was with the 1st Field Hospital, and went as far as Amoaful. As far as the Prah got rum occasionally, perhaps three times in seven days. First issue at Mansu. Before this had felt no want, nor did the men crave after it. From Mansu to Yancoomassie-Ashantee, had no rum; did not feel the want of it. Marched from Yancoomassie to Prahsu in one day; distance said to be sixteen miles, but thinks it must have been more. The men (twenty-six in number) were almost all knocked up. On arriving at Prahsu at 8.30 p.m. they had tea and bread, and $2\frac{1}{2}$ ounces of rum with cold water. All the men seemed to want the rum, and to be the better for it. When the men got in they were so exhausted they could do nothing but lie down; they lay for thirty

or forty minutes, and then had their tea and rum. After this they seemed greatly revived, moved about, and went down to the Prah and bathed, and afterwards felt all right. All the men took the rum ; there were no teetotallers. Is of opinion the tea and rest alone would not have done what the glass of rum did. The next day the men were out early at work cutting bushes, and seemed all well, and not fatigued by the previous day's march. Stopped at Prahsu a week. Had rum once or twice ; the men did not seem to crave after it at all, but they were glad to get it. When they got it they generally said, "This is no good ; it's not enough ; we ought to have some more." It did not seem to do much one way or the other. After crossing the Prah they got rum ($2\frac{1}{2}$ fluid ounces) every day ; usually had it about four or five in the evening, and took it after tea ; felt well after it.

His opinion is that the rum did him good ; he felt revived by it ; he mixed it with a good deal of water, and also mixed lime-juice with it.

Corporal HINDLEY, *Army Hospital Corps*

Sixteen years' service. Strong, good health, always temperate, never takes spirits ; his custom is to take one quart of ale per day, chiefly at dinner, and a drop before going to bed. Marched with the 2nd Field Hospital to Amoafu. Had two rations of rum (a ration equal to $2\frac{1}{2}$ fluid ounces) on the way

to the Prah, taken in the evening just before going to bed. Thought it useful ; when there was no issue, felt chilly and cold at night ; felt warmer when he had taken the rum, and slept better ; had no doubt about feeling warmer and sleeping better. On the next day felt no ill-effects from the rum. After crossing the Prah had rum regularly every evening. It seemed to suit him very well. He always took it just before he went to sleep ; it did not increase perspiration. He had a blanket, and used to wrap himself up in it, and kept as warm by night as by day. On one occasion, while marching down with the sick, the rum ration was not issued ; he fancied he felt more chilly in the night and the next morning on that occasion.

When marching back from Coomassie with the sick, the work was so heavy that he felt dead tired at night, and then the rum seemed to revive him a little, and he could eat a little. Never had the rum while marching ; he does not think it would have suited him, because he supposes it would have caused more perspiration. The rum seemed to make him sleep better, but not too heavily ; if anybody wanted him, and slightly touched him, he could wake at once.

His opinion is that the rum was useful ; he was not prejudiced in its favour, as he is not a spirit-drinker. The ration seemed small, but certainly acted very well. He was personally satisfied with it. The best time was certainly in the evening. He had no fever on the Coast or since.

On the Coast, American white rum and Hollands

and palm wine could be bought, and some of the men drank these liquors, but those who did so always seemed very wretched the next morning.

CONCLUSIONS FROM THE FOREGOING EVIDENCE

In attempting to sum up a few conclusions from this evidence I shall try to distinguish between facts and opinions.

The facts are these :

I. Entire abstinence from alcohol did not make the men who abstained more sickly as a whole, or more disposed to malarious fever. This is proved by the following figures. In the 42nd Regiment there were 24 teetotallers, and they had 4 cases of sickness, as shown in the table; one of these was from fever, one from diarrhoea, one from inflammation of the lungs, and one from an unstated cause which I will call fever. In Captain Brackenbury's history of the campaign the admissions of the 42nd Regiment are thus given by Dr Mackinnon (vol. ii, p. 343) :—Admissions from all causes, 690 per 1000 of strength ; admissions from fevers, 423 per 1000. Calculating the admissions of the teetotallers per 1000 of strength, we have—admissions from all causes, 166 ; admissions from fevers 83. To put this in another form : the actual strength of the 42nd Regiment (including teetotallers) was 656 non-commissioned officers and men, and they gave 453 cases of sickness, or there were 2 admissions for

every 3 men ; the teetotallers were 24 in number, and gave only 4 cases of illness, or one admission out of every 6 men. It may safely be concluded that the teetotallers were not more unhealthy than the regiment at large. It is also almost certain that they were more healthy ; but here the small number of teetotallers makes the calculation more uncertain. If the limits of error are calculated out

by Poisson's rule $\left(\frac{m}{\mu} \pm 2 \sqrt{\frac{2 \cdot m \cdot n}{\mu^3}} \right)$ the possible

range of the total sick of teetotallers per 1000 of strength is no less than ± 215 ; that is, the error, arising from the small number is so great that the 166 admissions might have been 381 per 1000 ; or there might have been no admissions at all. The range of error in the case of the non-teetotallers of the regiment is ± 51 ; and if the error happened to be minus, the admissions per 1000 would have been 659 instead of 710. Even allowing, however, for the error consequent on the small numbers, the advantage is largely on the side of the teetotallers. If fevers alone are taken, the possible error in the teetotal calculation is ± 160 ; so that instead of 83 cases there might have been 242 cases of fever per 1000 of strength. In the non-teetotal part of the regiment the possible error is ± 56 , and the admissions might have been only 361 per 1000. But even here, supposing the numerical error to be entirely against the teetotallers and in favour of the non-teetotallers, the former would have still a great advantage.

The reason of this advantage is tolerably clear ;

the remarkable health enjoyed by the teetotallers in India (as shown by Dr Troup's table), and the observation he makes as to their good physique and care of themselves, prove that they benefited on the Coast by their previous good conduct and superior health ; their advantage was not so much in the abstinence at the time from the $2\frac{1}{2}$ ounces of rum their comrades had, as in the condition they had brought themselves into by long-continued good conduct. The table is a singular testimony to the general advantage of total abstinence, and shows also, to say the least, that the want of the spirit ration did no harm to these men on the Coast.

In the Rifle Brigade there were only five teetotallers, and the numbers are so small that the calculation becomes very uncertain. It is as follows, if we suppose the case of sickness alluded to by Mr Wiles to be fever, and include the case on board ship.

Admissions per 1000 of strength

		From all causes.		Fevers.
Regiment	...	770	...	574
Teetotallers	...	400	...	400

If a correction is made by Poisson's rule, the non-teetotal part of the regiment might have had as few as 758 total admissions and 519 fever admissions per 1000 of strength ; while the teetotallers might have had 462 total admissions, all from fever. Here, again, the calculation is in favour of the

teetotallers, even after every point is given against them, and if their greatest possible sickness is contrasted with the least possible sickness of the non-abstainers.

The independent evidence of Surgeon - Major Wiles is also in favour of the teetotallers, as he thought the spirit ration increased susceptibility to the malarious poison and the affection of the bowels. The 23rd Regiment had no teetotallers.

II. The marching powers of the teetotallers of both regiments were good, and the evidence of Surgeon-Major Wiles as to his own endurance in marching is in accordance. The evidence is also against the usefulness of rum *during* marching ; the careful trials of Dr Kynsey on himself, and the evidence of Sergeant Perrin, show that during marching the invigorating effects of alcohol soon went off, and were succeeded by increased languor. Although none of the other men had an opportunity of determining this point (as rum was only issued after marching), the remark of Sergeant Kemp as to the effect of spirit in India making it difficult to get the men along, is corroborative.

III. The reviving effect of the rum when given at the end of the day was strongly spoken to by several of the men, and is corroborated by Dr Kynsey. The evidence is the more valuable as some of the men were unaccustomed to spirits and had no prejudice in their favour.

The testimony is, in fact, quite in accordance with physiological knowledge, that under exhaustion after great exertion alcohol will quicken the

heart and act for the time as a restorative, though it may be hurtful or not useful during the actual period of exertion. The general feeling of warmth caused by alcohol, and the temporary strengthening of the heart's action, were also, no doubt, succeeded by a slight anæsthetic effect, making the sleep rather more profound.

IV. The evidence of one or two of the men is that they marched better when rum had been issued on the previous evening. Soldiers in general are so disposed to think that they cannot get on without spirits that too much weight must not be given to this, but it does not seem unlikely. It has been shown that when the amount of alcohol in twenty-four hours is not more than 1 fluid ounce (and that is about what these men received in the $2\frac{1}{2}$ fluid ounces of rum), the temporary quickening of the heart's action is succeeded by a fall to such an extent that the mean work of the heart in the twenty-four hours is the same whether alcohol is taken or not. The amount of rum given to these men would not then overwork the heart—*i. e.* would allow time for proper repair,—and the better sleep which they appear to have had after it would probably be more restorative to the nervous system.

V. Some of the evidence indicates the greater power of digestion given by the rum, and the increased appetite caused by somewhat changing the monotony of the food.

Such appear to be the main *facts* brought out by the evidence. The *opinions* (*i. e.* the conclusions of

the different witnesses from facts which were before them, but which others cannot estimate) are rather various. While Dr Troup, in spite of his strong testimony to the value of abstinence as a rule, is in favour of alcohol on the Gold Coast, and Dr Fox, Dr Kynsey, and Surgeon-Major Jackson all agree in this view, Surgeon-Major Wiles is much opposed to rum, though he would have liked a beer ration to have been issued. Sir Anthony Home is also in favour of beer or wine in preference to rum, but considers the latter must be issued under the usual circumstances of a campaign. Among the men Sergeant-Major Barclay is opposed to the ration ; the others are in favour of it. All, however, are in accord on these points—namely : that the amount of the ration (half a gill, or $2\frac{1}{2}$ fluid ounces, in twenty-four hours) was sufficient ; that it was given at the proper time—viz. after the day's work, and with or after the evening meal ; and in the proper form—viz. diluted and mixed with lime-juice and sugar, or put into tea. These rules are real practical gains from this campaign, showing us, at any rate, the proper limits of the issue and the best time and form in which to give it.

Let it now be admitted that the Gold Coast campaign has at any rate proved that the rum ration should not be given in greater quantities than $2\frac{1}{2}$ fluid ounces (one eighth of a pint) per man daily (since this amount did all we can expect from it) ; and that the time for giving it is, as a rule, not before or during, but after a march.

Then recurs the question already stated : Was the rum ration really necessary ? did it do good ? did it do harm ?

Most persons who have read the foregoing evidence will probably agree with Sir Anthony Home that the experience of the Gold Coast campaign is not sufficiently large or accurate to enable us to give a decision on a really scientific basis, and that all that can be said is that the evidence from the 29 teetotallers in the 42nd Regiment and Rifle Brigade proves that it was not a necessity, while the other evidence shows that under special circumstances it produced effects which we must consider to have been useful. And all will no doubt agree that Sir Garnet Wolseley acted wisely not only in his judgment of the quantity and time, but also in making it an extra issue, to be given when deemed expedient by those best able to appreciate the condition of the men and the circumstances under which they were placed.

But it cannot be doubted that among many of the officers engaged in the Gold Coast campaign, and among the newspaper correspondents, a somewhat different opinion is held. The evidence which has been brought forward of late years to show that armies have made the greatest exertions and have gone through the severest hardships without spirits, and have even been the better for the abstinence, and especially the wonderful march made by Sir Garnet Wolseley in the Red River expedition, had produced a general belief that spirits were in all cases hurtful, or at any rate unnecessary, on service.

Many of the officers in the expedition from the Gold Coast returned with their faith in this doctrine much shaken. They found themselves in a climate which is enervating and exhausting in the highest degree, in which exertion is most difficult, and every feeling seems to crave for a stimulant.* It seemed to many as if alcohol were the only thing which could enable them to do their work.

It is not only a military but a physiological question of the highest interest, whether this desire for a stimulant felt by some officers ought to have been indulged. Alcohol would no doubt exert its usual effect. It would quicken the heart, and restore for the time the failing circulation ; it would perhaps increase the perspiration ; it would not increase, it might even slightly lessen, the temperature of the body, though so large a quantity is necessary for this that this effect cannot be reckoned upon. It might, when taken with food, increase the appetite and digestive power, and thus aid the restoration of the tissues. All this may be admitted, and when alcohol was taken within the limits of moderation (which the ration was), and in the way and at the

* This arises probably not so much from the heat of the climate (at Cape Coast Castle, in December and January, the mean shade temperature at the hottest time of the day is often only 84° or 85°), but from the great amount of moisture in the air. On the Coast the mean difference between the dry and wet bulb is only 2·5°, and in the interior the air is often quite saturated. Consequently, the perspiration from the surface of the body is not carried off. The slightest exertion bathes the body in perspiration ; this is not because more perspiration is produced, but because less is evaporated. The heat of the body therefore rises, and the sense of exhaustion and fatigue produced by this condition is extreme.

time pointed out by Drs Troup and Kynsey in their evidence, it can, I think, hardly be denied that it was useful to many men. But it cannot be for a moment admitted that the craving for stimulants was a proof of their necessity. The exhaustion felt on the Gold Coast was the consequence of physical conditions which nothing could alter. The effect of alcohol would have only temporarily relieved it, and, as pointed out by two witnesses, the subsequent feeling of languor would have been greater than before, and a renewed recourse to alcohol would have been necessary. The languor and exhaustion showed that the climate was not fitted for Europeans, but all we know of the physiological effects of alcohol and all the evidence of tropical service prove that under such conditions alcohol is not the remedy, but is the most faithless of helps. It could not do what is here demanded from it, and belief in it has led to innumerable deaths.

If alcohol was useful on the Coast, and I do not deny that under certain conditions it was so, it is most important that its issue should be based on the right grounds. These are shown, I think, in the evidence I have now brought forward, which has been collected impartially and without any attempt at selection. It agrees with what is known of the physiological action of alcohol, and it may truly be said that the effects stated in the foregoing evidence might have been confidently predicted.

One more remark of a practical kind may perhaps be allowed. The reviving effect produced by alcohol after great fatigue, and the power thus temporarily

obtained of continuing the exertion if necessary, is a valuable quality well illustrated by some of the evidence. But this gain is only for a time, and is followed by increased exhaustion; for, to use the common phrase, alcohol is a stimulant merely, and not a renovator, in the sense of supplying materials to exhausted tissues. This can only be done by food and rest; and as in the Ashanti campaign the men had food before or with, and rest after, the rum ration, and as the quantity of rum was within the limits of moderation, the reviving effect was felt without the subsequent depression. But no use appears to have been made in the Ashanti campaign of one of the most valuable foods for periods of great exertion which modern science has given us. I refer to the meat extracts, which also remove the sense of fatigue, but do so, in part at least, by supplying directly to the tired muscles the materials they want—viz. the special potash salts, and probably animal extractive matters, which have a reviving influence on the exhausted nerves. From their small bulk and consequent ease of carriage, their form, which permits of ready distribution, and their facility of digestion and absorption when mixed with either hot or cold water, they are at present the most available renovators we know of after great fatigue. They more than replace alcohol, or, if thought desirable, they can be used with it, and in this case will probably be found to lessen the increased depression which ensues when the effect of alcohol passes off. I have thought it not immaterial to call attention to these valuable agents,

which seem especially adapted for use in modern war, and which, without superseding the use of the usual food, or doing away with the necessity of rest, yet give to the modern commander additional means of increasing the marching and enduring power of his troops.

APPENDIX I

EXPERIMENTS TO SHOW THE RELATIVE REVIVING EFFECTS OF RUM, EXTRACT OF MEAT, AND COFFEE, DURING MARCHING

In order to show the correctness of the statement made in the last paragraph of the foregoing report, the following experiments are given.

Three intelligent and trustworthy soldiers, who knew the nature of the experiments, made the following marches in heavy marching order, carrying the rifle and sword bayonet, the valise equipment with service kit, forty rounds of ammunition, great coat, water bottle (full) and haversac (empty); in all, including the clothes on person, there was a total weight of 51 lbs. avoirdupois.

Having breakfasted at six o'clock, they started at seven and marched thirteen and a quarter miles without a halt or refreshment of any kind. This march was accomplished in four hours and twenty minutes. After resting for an hour, during which time their pulses and temperatures were taken, they received either rum or extract of meat or coffee, with

in each case ten fluid ounces of water. They then marched four and a quarter miles, making seventeen and a half in all, and then after another halt had a second allowance of the same substance, with the same quantity of water. A march of three miles was then made, making twenty and a half miles. The rate of march was 3·2 miles per hour ; the time taken was eight hours and a half, of which two were occupied with halts. At the end of the last march the men had their dinner. The rations were the usual rations, and the same amount of food was taken daily. The marches were continued for six days, so that each man received rum on two days (but not on successive days), meat extract on two days, and coffee on two days.

The quantities taken were two and a half fluid ounces of rum before the second and third sections of the march, making five fluid ounces daily. This particular spirit, and this amount, were selected because rum is the issue to soldiers and because two and a half ounces was the Ashanti ration. As the rum contained forty per cent. of absolute alcohol by measure, the total quantity of five fluid ounces contained two fluid ounces of alcohol, or one fluid ounce each time. This amount is the maximum limit of moderation as determined by the late Dr Anstie and myself. I was certain from previous experiments that anything over this would narcotize in some degree and lessen marching power. The rum was mixed with eight and a half fluid ounces of water, and a little sugar was added. The extract of meat was obtained from Liebig's Company, and

was given in quantities of half an ounce in ten fluid ounces of water before the second and third sections of the march, so that one ounce was taken daily.

The coffee was boiled ; half an ounce was used for ten ounces of water, so that in all one ounce of coffee was used daily ; half an ounce of sugar was added to each quantity, or one ounce of sugar daily. In order to judge of the relative effects of these substances I relied especially on the statements of the men. I was fortunate in being able to get Sergeant-Major Don as one of the marchers ; he volunteered for this work, as he felt desirous of practically determining for himself the relative effects of these articles. I have complete confidence in his honesty and impartiality. I may say the same of the other men (Privates Holz and Hutchins). I explained to them the question at issue, and they fully understood that they were to be perfectly independent in their opinions, and that what was wanted was simply an honest statement of how far they felt more able to march after rum, meat extract, or coffee.

In order to avoid all fallacies the men took no water except what I gave them ; in all cases the fluid was at a temperature of 100° Fahr., so as to avoid the influence of either cold or heat.

The following statements are given in the men's own words.

EFFECTS OF RUM

(*2½ fluid ounces in 8½ ounces of water at 12.30 after thirteen and a quarter miles, and again at 2.30 after four and a quarter miles more*)

SERGEANT-MAJOR DON took rum on the second and fifth days.

On the second day he was not well on starting in the morning for the thirteen miles' march ; he had slept badly ; his pulse at the end of the march was extremely quick, feeble, and irregular every twelfth or sixteenth beat. It becomes slower and regular after lying down for an hour. After the rum at 12.30 he felt a decided reviving effect ; to use his own phrase, it gave him a spurt ; this was not lasting ; towards the end of the second part of the march he felt that the good effects were over. He thought the reviving effect inferior to the coffee which he had taken the day before.

The second dose of rum made him feel slightly intoxicated ; as before, he was revived for a time and the intoxicating effect was not enough to damage his marching power.

On the fifth day he had rum again ; the first quantity, as before, revived him, gave him a sort of spurt, and enabled him to march better ; this reviving effect lasted for two and a half miles, and then seemed to pass off. For the time he certainly marched better, though he was quite certain the effect went off as stated. It made him feel thirsty.

The second dose of rum caused slight intoxication, as on the former occasion ; there was a little reviving power, which soon passed off and left a feeling of thirst ; he did not think this second quantity did much for him.

PRIVATE P. HOLZ had rum on the first and fourth days. On the first day after the first dose felt at first much revived ; felt easy and marched better ; after two miles felt thirsty and then got weak, and did not march so comfortably ; the good effect of the rum had passed off. After the second dose he felt it get into his head ; he was revived and able to march very well, but was a little thirsty ; he felt fatigued the last part of the march ; it did not make him march worse, but did not do much good. On the fourth day, after the first dose he felt a little intoxicated ; he was at first revived, but after about one mile and a half this effect went off and he felt just as tired as before ; he could have marched as well without it.

After the second dose he felt rather tipsy, and his head was heavy on returning from the march ; at first it took away all feeling of weakness, but in a mile he felt as fatigued as before ; he does not think it made him march worse, but he could have marched just as well without it. It made him feel thirsty.

PRIVATE W. HUTCHINS had rum on the third and sixth days. On the third day he did not think the rum did him any good ; just at starting and for about half a mile he felt revived ; then this effect

went off ; he was thirsty and clammy in the mouth ; he did not feel much good or much harm from it ; what good effect there was went off very soon.

After the second dose he felt rather more revived ; it caused flushing of the face ; he could not see that it gave him power, nor did it take power away, but it did not add to it.

On the sixth day the first dose of rum seemed to quicken his appetite and increase his thirst ; for about two miles or so felt lighter and revived and as if he could have jumped over a five-barred gate with all his accoutrements on ; then this effect entirely went off and he felt as tired as before ; he did not feel more tired, but just as he was before.

After the second dose he did not feel so lively ; it did rouse him a little, but this went off very soon ; he supposed he had not gone a mile and a half before the effect was gone ; he then felt languid and lazy, more so than he felt all along. It flushed him and made him thirsty.

EFFECTS OF EXTRACT OF MEAT

(*Half ounce in ten ounces of water at 12.30 and 2.30*)

SERGEANT-MAJOR DON took the meat extract on the third and sixth day.

On the third day after taking the first dose of extract he felt as if he had had a meal, and was able

to go on ; it seemed to give him strength ; he felt a little tired as he came back from the march and had a little thirst ; he thought the meat more sustaining than the coffee, but it did not quench thirst so well ; the meat gave him more power than the spirit, and this effect was more lasting ; the influence of the spirit soon went, that of the meat did not do so. Had a little palpitation coming back. After the second dose at 2.30 felt better and sustained by the meat extract ; had no doubt about this reviving effect ; there was a good deal of thirst ; no palpitation.

On the sixth day the meat produced the same effect as before ; it seemed to give him strength, he felt as if he had had a meal ; the reviving effect was lasting ; there was some thirst. After the second dose the same effect was produced.

PRIVATE P. HOLZ had meat extract on the second and fourth days. On the second day he did the first thirteen miles pretty well, but felt the ascent of a low hill one mile from Netley, and on coming up some steps to the room where his pulse was to be taken he felt giddy ; on entering the room he looked pale and exhausted, and while standing to have his pulse taken he fainted. It was a question whether he ought to march again that day, but as his pulse (which had been extremely weak and almost imperceptible) recovered at once on lying down, it was decided to continue the experiments. At 12.30, after an hour's rest, he had the first half of the extract of meat, the effect of which was noticed with interest. He felt revived and stronger for the extract ; had no doubt of this ;

did the four miles' march very well; no giddiness coming up stairs; he felt a little faint when standing to have his pulse taken, but nothing like the first time. Comparing the extract with the rum which he had taken the day before, he was certain he felt much better from the extract; with the rum he felt better at the beginning of the march, but not afterwards; with the meat extract he felt revived, and this continued all the march; it was different from the rum, and was most decidedly far better.

At 2.30 he had the second half of the extract; he started feeling strong and well; he did the three-mile march well, and marched quite strongly; he did not feel at all faint, and felt the extract more strengthening and reviving than the rum.

On the fifth day on coming in after the thirteen-mile march he felt weak; at 12.30 he had the extract; he felt greatly revived, and at the end of the four-mile march was not so weak as after the thirteen miles; he felt as if he could go on at once, which he did not feel before the extract; he felt a little thirsty, but not so much as after the rum; had no doubt that the rum was less strengthening than the extract. At 2.30 he had second quantity of extract; felt much revived; did the march well.

PRIVATE H. HUTCHINS had meat extract on the first and fourth days. After the first dose at 12.30 felt greatly revived; did the four miles well, and felt no more tired at the end than at the beginning; no thirst, but he had not felt thirsty before; after the second dose felt again much better, and felt more

power of going on ; beyond a doubt felt much benefit from the extract. On the fourth day, on coming in from the thirteen-mile march, he felt tired and hungry ; after the extract at 12.30 felt greatly revived, and felt as if he had a meal ; marched better ; had no doubt about this reviving effect. At 2.30 he had the second quantity ; it did him much good, and gave him power to go on.

EFFECTS OF COFFEE

*(Half an ounce of coffee in ten ounces of water at 12.30
and 2.30 ; half an ounce of sugar)*

SERGEANT-MAJOR Don had coffee on the first and fourth days. On the first day he was unwell during the first thirteen miles ; he was giddy and weak, and marched badly. After the first issue of coffee at 12.30 he felt much better ; lost all sense of giddiness, and felt that the coffee had a sustaining power ; it removed his thirst partly, but not wholly. After the second dose he again felt better, did the work well, and felt as if he could have gone through the work again. On the fourth day he felt fatigued when he came in after thirteen miles ; he found the coffee had a most decided effect ; he marched better, and at the end of the four miles the good effect had not gone off. After the second quantity felt very well, marched well, and was revived ; had not the slightest doubt that the coffee gave him power to go on.

PRIVATE P. HOLZ had coffee on the third and sixth days. On the third day after the first issue of coffee the thirst was lessened ; he felt at first a little revived, but not afterwards, and on the whole felt little effect, yet, as compared with the rum, he thought the effect of the coffee was better. After the second dose he felt a little revived, but the effect was not great ; it lessened thirst at first, but not afterwards ; it did not seem to do much one way or the other.

On the sixth day the coffee relieved thirst ; it seemed to revive him a little, but not much ; it did not seem to give him strength ; was decidedly much inferior to the meat extract, which seemed to give him strength. The second quantity of coffee seemed to do more good ; it took away thirst ; he did not know if it gave him strength, but he felt better.

PRIVATE W. HUTCHINS had coffee on the second and fifth days. On the second day felt the coffee assuage thirst ; did not feel otherwise any great effect, but thinks he should not have marched so well without it. After the second quantity at 2.30 felt somewhat revived and better ; thinks the coffee decidedly inferior to the meat extract, which seemed more reviving and nourishing, and more lasting.

On the fifth day the coffee had the same effect as before ; it quenched thirst, but did not revive him much, if at all. After the second quantity the thirst was quenched, but the reviving effect was not great.

FINAL OPINION OF THE MEN

At the end of the experiments the men were asked to state their candid opinion of the relative value of these three substances during marching.

SERGEANT-MAJOR DON said—"The meat extract is the best to march on ; more strength is given by it ; about this I have not the slightest doubt. After the extract I prefer the coffee, and I put the rum last for marching, though if a man had to lie out all night on wet ground it would do good. But for marching I do not think it the proper thing. The coffee was best for thirst, and also gave me a more comfortable feeling than the other two."

PRIVATE P. HOLZ said—"I prefer the meat extract ; in rainy weather the rum might be best, as I found it warmed me more, but for getting along in marching the extract is the best, it gave me more strength. As regards the coffee, I would put it before the rum, as the effect of the rum went off in two miles, and I felt better after the coffee than after the rum."

PRIVATE W. HUTCHINS said—"I prefer the meat extract ; it certainly gave me more strength for marching ; it does not put a spurt into you for a few

miles, but has a lasting effect; if I were ordered for continuous marching, and had my choice, I would certainly take the meat extract. The coffee quenched thirst, but did not seem to do much or to put any spurt into me. But still I prefer the coffee to the rum, because it quenched thirst, and also the rum at the end of a couple of miles left you as bad as before, or even worse, while the coffee had no effect of this kind."

The following tables give the pulse and temperature.

The respirations are not recorded, for they were found to be unaffected.

The men carried the valise equipment, which leaves the chest so free that on no occasion was there the least breathlessness or any increase in the number of respirations.

Sergeant-Major Don had not carried a knapsack for eight years, and was not very well when the marches commenced. The effect on his heart was so great (the pulse rising on three days after seventeen miles' march to 160, and even 165, and being excessively weak and irregular) that I was nearly stopping the experiments. However, the heart gradually strengthened in the three last days, and he seemed to get into condition, though it was always more easily quickened than in the case of the other two men who were younger. No decided effect of the rum, extract, or coffee can be traced in the pulse and temperature; the exercise seemed to over-

SERGEANT-MAJOR DON.—Age, 35. Height, 5 ft. $7\frac{3}{4}$ in. Weight, 154 lbs.

Pulse.

POSITION.	HOUR.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day.
Before marching; erect, with equipment.....	7	98	104	98	90	108	
After marching 13 miles; erect, with equipment.....	11.20	127	130	137	127	126	117
After lying down without equipment 20 minutes	11.40	92	87	78	80	84	80
Erect, with equipment, before 2nd part of march	12.30 {	Coffee	Rum	Meat extract	Coffee	Rum	Meat extract
Erect, with equipment, after marching 4 miles	1.40	119	108	101	99	97	
After lying down 20 minutes	2	160	160	165	112 p	129	124
Erect, before 3rd part of march	2.30 {	Coffee	Rum	Meat extract	Coffee	Rum	Meat extract
Erect, with equipment, after 3rd march	3.30	103	116	95	91	94	
After lying down 20 minutes	3.50	134	145	151	139	128	129
		92	93	81	77	84	80

Temperature.

Temperature was taken in the mouth.

Before marching	7	97.4	98.4	98.9	98.9	97.8	98
After 1st march	11.40	99.6	99.2	98.6	98.6	99.3	98.7
" 2nd "	2	100.4	100	99.1	99.1	99.2	99.4
" 3rd "	3.50	102	100.3	99.4	99.4	98.4*	99.2

* Uncertain. The men were wet and the time of observation was shortened.

PRIVATE P. HOLZ.—Age, 22. Height, 5 ft. 9 $\frac{1}{4}$ in. Weight, 153 lbs.

Pulse.

POSITION.	Hour.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day.
Before marching; erect, with equipment.....	7	82	89	90	89	89	96
After marching 13 miles; erect, with equipment	11.20	105—112	Fainted	114	124	123	114
After lying down without equipment 20 minutes	11.40	78	74	72	68	73	70
Erect, with equipment, before 2nd part of march	12.30 {	Rum	Meat extract	Rum	Meat extract	Meat extract	Coffee
Erect, with equipment, after marching 4 miles	1.40 {	82	106	106	89	95	97
After lying down 20 minutes	2	122	120	106	132	111	114
Erect, before 3rd part of march.....	2.30 {	Rum	Meat extract	Rum	Meat extract	Meat extract	Coffee
Erect, with equipment, after 3rd march	3.30 {	88	102	82	95	86	86
After lying down 20 minutes	3.50	112	126	113	139	112	97
		69	70	67	80	70	71

Temperature.

Temperature was taken in the mouth.

Before marching	7	98.6	97.4	98	98.4	97.8
After 1st march	11.40	98.8	97.6	98.1	98.9	98.6
" 2nd "	2	98	97	97.8	99	98.4
" 3rd "	3.50	98	97.9	97.8	98.8	97.5*

* Uncertain. The men were wet and the time of observation was shortened.

PRIVATE W. HUTCHINS.—Age, 22½ years. Height, 5 ft. 9¾ inches. Weight, 150 lbs.

Pulse.

POSITION.	HOUR.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day.
Before marching; erect, with equipment.....	7	83	88	80	87	85	
After marching 13 miles; erect, with equipment	11.20	95	91	86	91	83	
After lying down without equipment 20 minutes	11.40	61	67	58	66	61	Rum
Erect, with equipment, before 2nd part of march	12.30 {	Meat extract	72	94	Coffee	Coffee	
Erect, with equipment, after marching 4 miles	1.40	64	99	..	Rum	78	73
After lying down 20 minutes	2	91	62	62	63	87	85
Erect, before 3rd part of march	2.30 {	Meat extract	74	96	Coffee	55	88
Erect, with equipment, after 3rd march	3.30	75	81	72	Rum	55	63
After lying down 20 minutes	3.50	97	62	64	Meat extract	70	76
					Coffee	89	94
					Rum	55	67
						98	
						58	
						98.1	

Temperature.

Temperature was taken in the mouth.

Before marching	7	98.2	97.8	97.9	97.8	97.4	97.8
After 1st march	11.40	98.2	97.6	98.2	97.9	97.4	97.7
" 2nd "	2	97.9	97.3	97.4	97.8	97.4	97.6
" 3rd "	3.50	98.4	97.6	97.5	98.1	97.2*	97.5

* Uncertain. The men were wet and the time of observation was shortened.

ride all other conditions, and if the heart were quickened by the alcohol, this effect had passed off during the march. In this man the temperature almost invariably rose a little during the march.

In Private Holz the pulse was much less excited than in Sergeant-Major Don ; no decided influence of the rum, extract, or coffee can be traced. The temperature was not at all raised by the exercise ; but was, if anything, slightly lowered.

In Private Hutchins the heart was much less affected by the marching ; the pulse was always perfectly regular and even. This was the case also with the temperature. He was, in fact, the strongest of the party.

It may be concluded from these tables that no argument for or against rum, meat extract, and coffee can be drawn simply from the pulse or temperature ; a different mode of experimenting would, in fact, have been necessary to show their influence ; but that could not be done without giving up the special object of these trials, which was to note the marching power of the men.

These tables are interesting, not only in showing the effect of marching on the pulse, but how soon the heart in healthy men recovers itself in the re-cumbent position. The following table puts this very clearly.

Table to show the effect of the recumbent position for one minute on the pulse.

	Standing erect with accoutrements after marching.						Lying down for one minute without accoutrements.					
	2	3	4	5	6	Mean.	2	3	4	5	6	Mean.
	Days.						Days.					
SERGEANT-MAJOR DOW:												
After 13 miles	127	126	117	133	105	110	93	85	92	89	88·6	
" 17 "	165	112	129	124	138	129	96	88	87	87	92	
" 20 "	151	139	128	129	138	129	94	90	89	89	96	
PRIVATE P. HOLZ:												
After 13 miles	124	123	114	120	81	86	78	84	79	74	79	
" 17 "	106	111	114	117	97	117	86	73	98	69	68	
" 20 "	134	112	112	97	117	117	86	73	77	71	71	
PRIVATE W. HUTCHINS:												
After 13 miles	86	91	83	87·3	70	68	72	83	79	71	77·6	
" 17 "	94	87	85	90·6	91	94	86	75	64	70	70	
" 20 "	96	89	98	94	91	94	86	76	66	74	74	

When the pulse had been taken in the erect position after marching, the men took off their equipment and lay down for one minute; the fall in the number of the pulse and the recovery of its volume and force in so short a time were surprising.

It will be seen that Sergeant-Major Don's heart fell on one occasion in one minute after lying down from 165 to 93, or no less than 72 beats. The average fall was 43 beats in one minute. Holz's pulse fell in one minute 39 beats on an average, or nearly the same. Hutchins' pulse (always slower than the others) only fell 16 beats on an average. On successive days the regularity of the means in each man is remarkable, and shows how really evenly (though at different speeds) the heart worked in all of them.

The practical importance of the above table is in showing how desirable it is (if the nature of the ground allow) to let the men take off their accoutrements and lie down at the halts. Of course on wet ground, or (as so well pointed out by my colleague Dr. Maclean) on very hot ground in the tropics, this may be improper, but whenever it can be done, even ten minutes' rest of this kind will greatly benefit a tired heart.

In summing up the results of these experiments, I feel no doubt that it is correct to put the meat extract far before the rum and coffee as a reviving agent in marches. I think the quantity of one ounce in the day was correct. It seemed to satisfy hunger and to give strength ; it did not lessen thirst, but on common marches the men would, of course, have

been permitted to drink water. The men were unanimous in their praise of it, and found it far more useful than the rum.

The effect of the rum was as expected, and the evidence of these men was quite in accordance with the Ashanti experience (of which they knew nothing), that the stimulating effect soon goes off and that the weakness and languor then becomes as bad, or even worse than before. But I was hardly prepared to find it go off in so short a distance as half to two and a half miles. It is also evident from the men's statement that the second allowance usually began to slightly narcotize them ; the reviving effect was on several occasions not greater, but was actually less than that produced by the first amount. The limits of the useful effect of rum were evidently reached by one ounce of absolute alcohol, and any further amount would, I believe, have made itself marked by decided lessening of marching power.

The effect of the coffee was not so great as I anticipated, but I attribute this, in part at any rate, to the amount of coffee being too small. I gave the usual ration of one ounce a day, but I am convinced that no great good effect will be obtained from it under an issue of two ounces a day, and it must then also be well made.

In order not to complicate the experiments, I did not try the effect of mixed spirit and meat extract, but it is clear that a mixture of the kind would have an immediate strong reviving power when men are greatly fatigued, and when a sudden and temporary effect is demanded, and also that this effect would

continue longer than with spirits alone. But these experiments also show that $2\frac{1}{2}$ ounces of rum is the limit that should be given for this purpose, and that it should be an exceptional issue, while the meat extract should be the usual issue. It is, of course, to be understood that the meat extract is not intended to take the place of the ordinary rations, but it is to be used in supplement of them, and for a special purpose.

APPENDIX II

I owe the following interesting accounts of the conversion of the gauge on the Great Western Railway (from broad to narrow gauge) to the kindness of W. J. Owen, Esq., Engineer in Chief of the Great Western Railway, and of J. W. Armstrong, Esq., and Henry Voss, Esq., Divisional Engineers, under whose immediate orders the work was done. The work was of the heaviest description, lasting from seventeen to eighteen hours a day for several successive days. It was the greatest work of its kind, and nothing exactly like it will ever be done again in England.

*Letter from J. WARD ARMSTRONG, Esq., Divisional
Engineer, Great Western Railway*

*Conversion of Gauge on the South Wales section of the
Great Western Railway in 1872*

In answer to your letter, I have great pleasure in telling you all I know about the sustaining powers of cocoa, coffee, oatmeal, and spirits, to men engaged in long-continued and arduous labour.

In the summer of 1872 I made the engineering arrangements and conducted the operation of narrowing the gauge of the South Wales section of the Great Western Railway, from Milford Haven to Grange Court Station, near Gloucester, a length, all branches included, of about 400 miles of single line.

The number of men employed was about 1500, and the time taken was two weeks nearly. The work done was enormous, for the Great Western is one of the very few English lines whose rails are held down by bolts screwed into nuts. All these had to be unscrewed and replaced after moving the rail two feet, a very different operation to prizing out a spike, shifting the rail a few inches, and hammering in the spike again.

As the period of completion was governed by the number of large stations and sidings to be dealt with, the open main line was manned so as just to keep abreast of their progress, and thus the *utmost amount* of exertion was maintained at every point.

The working day paid for at a fixed rate was nine hours, all overtime to be paid for at same rate. Very long days were made—in fact, nearly double time.

To illustrate the mode of living, I will take the gangs employed on the open main line. These gangs numbered about thirty men, and they were housed in lodges built along the line, about six miles apart. They were directed to bring with them the food they would want for about two weeks, and as a rule they provided cocoa, coffee, sugar, bacon, bread, and cheese.

At early dawn water was heated at the lodges and breakfast made. That over, a start was made for the scene of the day's work. Two men went in advance provided with a large iron pot, and oatmeal in 28 lb. packages. Water being found, a fire-place of stones was soon made and the pot boiled. Oatmeal was then sprinkled into it and added until thin gruel was made. As soon as the shout for drink was heard, buckets were filled and carried round, small tins being used to drink it from. The men soon got to like it exceedingly, and used it very largely to supplement their solid food. It was the only drink taken during the day. I had not a single case of drunkenness nor of illness. I have often since heard these men speak with great approbation of the supporting power of oatmeal drink.

It will be noticed that the oatmeal was cooked. I think it would not have answered nearly so well if it had not been. At the same time, it has long been common for men labouring at the furnaces in large iron works to drink cold water and oatmeal.

I will conclude by saying that, as the result of many opportunities for observing the best means of keeping up the energies of men undergoing great exertion, I am *not* in favour of *spirits*. I do not say "grog" may not be very desirable when men are exposed to cold or are surrounded by depressing circumstances while called on to labour hard; but with ordinary surroundings and nothing but the waste of the body to provide for, so far as drinks will do that, I am strongly and decidedly in favour of cocoa, coffee, and oatmeal.

Letter from HENRY Voss, Esq.

*Conversion of Gauge on the Wilts, Somerset, and
Weymouth District in 1874*

The work to be done consisted in slewing in the line from the broad gauge of 7 ft. $\frac{1}{4}$ in. to the narrow gauge of 4 ft. $8\frac{1}{2}$ in.

All the necessary preparations had been made before the slewing was commenced, the ballast having been removed to allow of the timber being slewed, and all the bolts and fastening loosened and well oiled, so that they might be removed with the greatest facility at the time of slewing.

The down line and sidings on that part of the railway which is double—about thirty-five miles—was done first; 314 men began this work on the 16th of June, and completed it, ready for a narrow-gauge engine to go over, on Saturday afternoon, the 20th of June.

The single part of the line and sidings—114 miles in length—was necessarily shut up while the conversion was going on, and therefore required to be done with as little delay as possible; 1353 men commenced this work on the 19th of June, 1874, and completed it, ready for a narrow-gauge engine to go over, on Saturday, the 20th June, and on Monday, the 22nd, narrow-gauge trains commenced running and the ordinary passenger traffic was resumed.

The men worked from daylight to dark. Lodgings were provided for them close to the work, in adjacent

farm-sheds and other buildings, where these could be obtained ; where no other lodgings could be found, huts were erected, each to hold a gang—twenty men—and a ganger.

Each man was allowed one pound of oatmeal and half a pound of sugar per diem, and a man was appointed to cook and serve it out to each gang of twenty-one men.

The men very much appreciated this drink, and had nothing else, no beer or spirits being allowed on the work.

They remained on this part of the line, finishing packing it up, until Thursday, the 25th June, when they were removed to the Berks and Hants District, where they did a similar work, in about the same time and under the same regulations.

There is a strong feeling on the part of the engineers that the good conduct of the men and the hard work done by them was due to the liberal supply of oatmeal which they had ; as it not only quenched their thirst, but sustained them and enabled them to keep on continually working very hard, from Friday morning at 4 a.m. until Saturday night at 9 p.m., with very little intermission.

The work from beginning to end of the conversion lasted nearly a fortnight, and the men seemed to appreciate the oatmeal during the whole time. The oatmeal supplied the place of water, beer, tea, or coffee. For meals the men had bread and cheese or meat, and in some cases they had beer at night after their work was over, but never on the work.

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